

REMARKS

Review and reconsideration on the merits are requested.

Applicants treat the issues raised in the Action in the order posed.

With respect to the objection to the Abstract, a new Abstract is submitted herewith.

With respect to the objections to claims 4-6 and 10-15 as being in improper form because a multiple dependent claim cannot depend from any other multiple dependent claim, the multiple dependency is removed.

Withdrawal of the above objections is requested.

Prior art considered: JP 10-180112 A (JP '112); U.S. Patent 3,268,295 Armbrust et al (Armbrust); U.S. Patent 6,042,716 Morel et al (Morel).

The rejections: claims 1-3 are rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '112 in view of Armbrust.

Claims 7 and 8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Morel.

Claim 9 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Morel further in view of Armbrust.

These rejection are respectfully traversed.

The Examiner's position on the prior art is set forth in the Action in detail and will not be repeated here except as necessary to an understanding of Applicants' traversal.

Armbrust discloses a technique relating to the preparation of alumina hydrate. Armbrust does not relate to the present invention in any reasonable fashion. Specifically, the crystallite diameter of alumina hydrate in Armbrust is that of "boehmite: alumina: hydrate". In claims 1, 2,

3, 4 and 6 of Armbrust, it is recited that the crystallite diameter of the boehmite is from 20 to 40 Å. Referring to column 8 of Armbrust, under the item “2. X-ray diffraction pattern”, it is quite clearly stated that the crystallite diameter was determined according to a method based on the half-value width of the peak at $2\theta = 28.1^\circ$ (attributed to boehmite).

In distinction, the crystallite diameter of the present invention is the crystallite diameter of “ γ -alumina”. The γ -alumina is prepared by calcining boehmite as a precursor at a temperature not lower than 500°C followed by phase transition.

Referring now to the present specification at page 9, line 2 from the bottom of the page, to page 10, line 2, it is disclosed that the crystallite diameter of the present invention represents that of γ -alumina.

Specifically, it is disclosed as follows:

“It is important the alumina should comprise a crystalline alumina (substantially γ -alumina) and this crystalline alumina should have a crystallite diameter of from 20 to 40 Å.”

Referring now to page 10, beginning at page line 22 of the specification, it can be seen that crystallite diameter is calculated from the half-value width of the peak at $2\theta = 67^\circ$, which would be attributed to γ -alumina. In this regard, the Examiner is requested to note that the catalyst of the present invention has no peak at $2\theta = 28.1^\circ$.

A catalyst having a peak $2\theta = 28.1^\circ$ under X-ray diffraction, (the crystalline diameter of boehmite as a carrier is 20 to 40 Å) is considered to have no activity as an oil refinery catalyst. Further, no catalyst using boehmite as a carrier is used in the oil refining industry.

From the above discussion, Applicants respectfully submit that it can be seen and understood that the present invention is completely from Armbrust. Accordingly, Applicants respectfully submit that any rejection based in whole or in part on Armbrust, for the reasons that the Examiner relies on Armbrust, would be improper and should be withdrawn.

Applicants now turn to JP '112, the primary reference.

Applicants would like to focus on the following remarks presented by the Examiner in the Action at page 4, second full paragraph:

“It also would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the catalyst of the JP 10180112A reference by utilizing a combination of platinum and palladium in any amount so that the total amount is within the range disclosed by the JP 10180112A reference and in any proportion because each metal is known to be effective individually. Therefore, the combination in any amount and proportion would also be expected to be effective.”

Referring initially to pages 14 and 15 of the present specification, it is quite important to the present invention that the platinum and the palladium be combined together (leading to bimetal formation).

Discussing the background to the above point a bit, as a means of suppressing catalyst poisoning due to sulfur, which is the primary cause of a decrease in activity in noble metal-based hydrogenation catalysts, the present invention is based on the use of a combination of platinum and palladium. This combination of elements can prevent the adsorption of sulfur on the catalyst, an extremely desirable result or effect.

Basis for this statement/conclusion is shown by the activity of Catalyst f in Comparative Example 6 of the present specification. As compared with the Examples involving a catalyst in accordance with the present invention, it is easily seen that the desulfurization and

dearomatization activities of Catalyst f are extremely low. Except for the fact that the active metal is only platinum, Catalyst f falls within the scope of the present claims with regard to all other requirements. From the results obtained with Catalyst f as compared to the results obtained in accordance with the catalyst of the present invention, it is believed that the importance or significance of using a combination of platinum and palladium is made quite clear.

Further, the complex (bimetal) formation of the active metals (platinum and palladium) in the catalyst of the present invention of the Examples in the present specification was confirmed by EXAFS measurements. See page 38 of the present specification. Note especially that the Pt-Pt coordination numbers for the catalysts in Examples 1, 3 and 4 are larger than the Pd-Pd coordination numbers.

Referring now to page 20 of the specification, in the case where the Pt-Pt coordination number is larger than the Pd-Pd coordination number by EXAFS measurement, the catalyst has a Pt-core/Pd-shell structure, i.e., one in which a platinum (Pt) grain is covered by a palladium (Pd) shell. This confirms "complex formation" and the Pd as active sites effectively functions in hydrodesulfurization reactions.

In distinction, in JP '112, generically the combination of platinum and palladium is broadly taught. While Applicants find it difficult to explain why the remarkable effects of the present invention are attained with a specific Pt/Pd mixing ratio, Applicants believe that logically the acid amount and metal dispersion degree are further important factors in accordance with the present invention.

Turning now to claims 7-9, in Table 1 of Morel, initial boiling point (IBP) and 95% distillation points are given.

However, even without referring to Morel, the two-step process of the present invention, where desulfurization is conducted in a first step, whereby hydrogen sulfide and ammonia gas are eliminated, and thereafter dearomatization is conducted using a hydrogenation catalyst (second step), has long been well known (Davy Process, Topsoe Process, Synsat Process of Criterion, etc.).

However, the key to present claim 7 lies in the recitation “the process in which the catalyst of claim 1 is used for the second step”. As has been previously explained, the present invention is quite different from the prior art relied upon, most especially Armbrust, and for this reason Applicants submit that claim 7, essentially incorporating the catalyst of claim 1, is allowable.

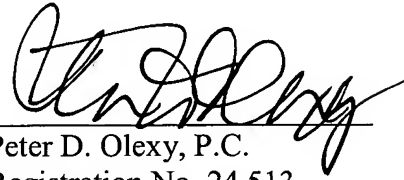
The crystallite diameter limitation of claim 9 is included into claim 7. This is a narrowing limitation to the crystallite diameters of claim 9 and the equivalents thereof.

In addition, Morel relates to a catalyst used for the first step of claim 7, and requires that the catalyst contains phosphorus as an essential component. Thus, Morel is quite different from claim 7.

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 10/070,235

Concerning all of the above, Applicants request withdrawal of the rejections and allowance.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Peter D. Olexy", is written over a horizontal line.

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Date: February 27, 2004